UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,334	06/28/2007	Yasuyuki Goto	2150LT/100227	7073

32885 7590 03/31/2011

STITES & HARBISON PLLC
401 COMMERCE STREET
SUITE 800
NASHVILLE, TN 37219

EXAMINER	
BOHATY, ANDREW K	

ART UNIT	PAPER NUMBER
1786	

NOTIFICATION DATE	DELIVERY MODE
03/31/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

richard.myers@stites.com
francine.vanaelst@stites.com
robin.avery@stites.com

Office Action Summary	Application No.	Applicant(s)	
	10/599,334	GOTO ET AL.	
	Examiner	Art Unit	
	Andrew K. Bohaty	1786	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-19* is/are pending in the application.

4a) Of the above claim(s) *7-19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is in response to the amendment filed February 7, 2011, which amends claim 1 and cancels claims 2 and 3. Claims 1 and 4-19 are pending, where claims 7-19 are withdrawn from consideration.

Response to Amendment

2. Applicant's cancellation of claims 2 and 3, filed February 7, 2011, has caused the withdrawal of the rejection of claims 2 and 3 under 35 U.S.C. 103(a) as being unpatentable over Tamano et al. (US 5,811,834) in view Doi et al. (WO 03/046108) as set forth in the Office action mailed August 5, 2010.

3. Applicant's cancellation of claims 2 and 3, filed February 7, 2011, has caused the withdrawal of the rejection of claims 2 and 3 under 35 U.S.C. 103(a) as being unpatentable over Murase et al. (JP2004-095221) as set forth in the Office action mailed August 5, 2010.

4. Applicant's cancellation of claims 2 and 3, filed February 7, 2011, has caused the withdrawal of the rejection of claims 2 and 3 under 35 U.S.C. 103(a) as being unpatentable over Murase et al. (JP2004-095221) in view of Spaochak et al. (WO 2005/073340) as set forth in the Office action mailed August 5, 2010.

5. Applicant's cancellation of claims 2 and 3, filed February 7, 2011, has caused the withdrawal of the rejection of claims 2 and 3 under 35 U.S.C. 103(a) as being unpatentable over Matsuura et al. (JP 2003-317965) as set forth in the Office action mailed August 5, 2010.

Response to Arguments

6. Applicant's arguments filed February 7, 2011 have been fully considered but they are not persuasive.

7. The applicant's amendment just incorporated the limitations of cancelled claims 2 and 3 into claim 1 and since these claims where all rejected in the rejections set forth in the Office action mailed August 5, 2010, the rejections are maintained.

8. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Tanaka reference was not used to show a phosphorous compound soluble in alcohols, but was used teach PEDOT/PSS as a material that can be used in a hole injection layer of an electroluminescent device. Tamano teaches the light emitting layer can be composed of a phosphorus containing organic compound (compounds (35) and (36) column 23 lines 29-38) and can be made using a wet method and the solvent can be ethanol (column 25 lines 11-26). Also, Tamano teaches the hole injecting layer is made of an electrically conductive polymers (column 49-67). The teaching of Tanaka, which is used to show that PEDOT/PSS can be used as an electrically conductive polymer, is not used for the phosphorous material taught by Tanaka. Also, since Tanaka shows that PEDOT/PSS can be used as an hole injection material in an electroluminescence device there is reason the modification of using PEDOT/PSS as

the hole injection material would work by combining the references. Therefore, the applicant's arguments are not persuasive.

9. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the electron transporting layer is made by a wet method where the electron transporting layer is dissolved in an alcohol, or the electron transporting layer is made with an alcohol) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

10. The applicant claim 1 states that the device comprises a hole-transporting layer mode of an organic compound insoluble in alcohols and an electron transporting layer formed on the hole-transporting layer by a wet method and electron transporting material is soluble in alcohols. The applicant's claim only requires that the electron transporting layer be made of a material that can be deposited using a wet method and is soluble in an alcohol. The claims do not require the electron transporting layer, when be formed by a wet method, to be dissolved in an alcohol; therefore, the applicant's arguments is not persuasive.

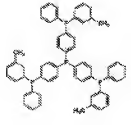
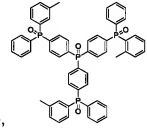
11. In response to applicant's argument that there is no teaching, suggestion, or motivation to combine the references, the examiner recognizes that obviousness may be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one

of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988), *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992), and *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 82 USPQ2d 1385 (2007). In this case, Murase teaches an electroluminescent device comprising an anode and a cathode and a hole transporting layer and an electron transporting layer found between the two electrodes (paragraphs [0005]). Murase teaches the hole transporting layer can be composed of NPD, which the applicant teaches as a hole transporting material that is not soluble in alcohols (paragraph [0015]). Murase teaches the electron transporting material can be a non-ionic phosphine compound and the phosphine compound (paragraphs [0028]-[0038] and [0043]), which meets applicant's formula (1). Murase teaches the electron transporting layer can be made by using spin coating a wet method (paragraph [0060]). Murase teaches electroluminescent devices that comprise the phosphine oxide have excellent thermal stability, high luminous efficiency, low drive voltage, and excellent color purity (paragraph [0078]). Given that Murase teaches each one of the applicant's limitations in claim 1, but does not specifically claim an electroluminescent device that teaches each aspect of claim 1, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select NPD as the hole transporting layer and one of the phosphorous compounds as the electron transporting layer and make the electron transporting layer using a wet method. Murase gives a limited number of preferred materials that can be used in each of the layer; therefore, it would have been obvious of one of ordinary skill in the art to select NPD of the hole transporting layer and one of the phosphorous compounds as the

electron transporting materials and one would expect the electroluminescent device to work given the teachings of Murase. Therefore, the applicant's arguments in not persuasive.

12. In response to the applicant's arguments that Murase does not teach the hole transporting layer is composed of a material insoluble in alcohols, Murase teaches the hole transporting layer can be composed of NPD (paragraph [0015]), which the applicant's teach is inherently insoluble in alcohols; therefore, the applicant's argument is not persuasive.

13. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Spaochak reference was not used to show all the limitations in claim 1, it was used to show different phosphorous compounds that can be used in the electron transporting layer of the electroluminescent device. Spaochak teaches phosphorous compounds that are the same as the applicant's compounds (PO1 and PO8); therefore, the electron transporting materials are inherently soluble in alcohols and the applicant's arguments are not persuasive. Given that Spaochak teaches the phosphorous compounds can be used in the electron transporting layer of an electroluminescent device, one of ordinary skill in the art would expect the materials can be used in other electroluminescent devices as electron transporting layers; therefore, the applicant's argument with regards to the combination of Murase and Spaochak is not persuasive.

14. In response to the applicant's arguments that phosphine oxide compounds claimed by the applicant are not obvious over Matsuura, Matsuura teaches the electron transporting material can be a non-ionic phosphine compound and the phosphine compound can have the following formula, formula (2), where X can be oxygen and R_{21}-R_{23} can be aryl groups, such as phenyl (paragraphs [0017]-[0042] and [0044]). Matsuura also teaches a similar formula (5), which is the same as formula (2) except that the X group is missing, but in both formulae R_{21}-R_{23} and R_{51}-R_{53} can be the same thing (paragraph [0068]). Matsuura teaches that the following compound represents formula (5),  (paragraph [0073]). Given the strong overlap of formulae (2) and (5) of Matsuura it would have been obvious to one of ordinary skill in the art to make a phosphine-oxide with the following structure,  . Furthermore, Matsuura teaches compounds of formula (2) and formula (5) can be used as electron transporting materials, so the materials have similar properties in that they have electron transporting properties; therefore, the applicant's arguments are not persuasive.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

17. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamano et al. (US 5,811,834) (hereafter "Tamano") in view Doi et al. (WO 03/046108), where Tanaka et al. (US 2005/0106413) (hereafter "Tanaka") is used as the English equivalent.

18. Regarding claims 1 and 4, Tamano teaches a light emitting device composed only of a hole injection layer and a light emitting layer disposed between the anode and the cathode; therefore, the light emitting layer is acting as the electron transporting layer as well (column 23 lines 39-55). Tamano teaches the light emitting layer can be composed of a phosphorus containing organic compound (compounds (35) and (36) column 23 lines 29-38). Compounds (35) and (36) are both nonionic and have molecular weights of 1401.53 g/mol and 1465.53 g/mol respectively. Compound (35)

reads on applicant's formula (1), where Ar^1 is a substituted aromatic ring residue (substituted phenyl group) and Ar^2 and Ar^3 and unsubstituted aromatic ring residues (phenyl groups). Tamano teaches that the light emitting layer can be made using a wet method and the solvent can be ethanol (column 25 lines 11-26). Tamano teaches that the hole injection layer can compose of electrically conductive polymers (column 49-67).

19. Tamano does not specifically teach an electrically conductive polymer that can be used in the hole injection layer that is insoluble in alcohols.

20. Tanaka teaches a light emitting device comprising an anode, a hole injection layer, a light emitting layer/electron transporting layer, and a cathode (paragraph [0178]). Tanaka teaches the hole injection layer is composed of PEDOT:PSS (paragraph [0178]). Tanaka teaches the PEDOT:PSS decreases the drive voltage and improves the hole injection efficiency of the electroluminescent device.

21. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute electrically conductive polymer of Tamano for PEDOT:PSS as taught by Tanaka. The substitution would have been one known conductive polymer that can be used in the hole injection layer for another conductive polymer and would lead to the predictable results of using PEDOT:PSS as a hole injection material in a light emitting device. The motivation would have been to use a hole injection material that decreases the drive voltage and improves the hole injection efficiency of the device.

22. Although Tanaka is silent on the solubility of PEDOT:PSS, PEDOT:PSS is a compound taught by the applicant that is not soluble in alcohols; therefore, PEDOT:PSS is inherently insoluble in alcohols.

23. The combination would lead to a device with an anode, a hole injection layer composed of PEDOT:PSS, which is insoluble in alcohols, a light emitting/electron transporting layer composed of a phosphorus containing compound, which is soluble in ethanol and can be deposited by a wet method, and a cathode as claimed.

24. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase et al. (JP2004-095221) (hereafter "Murase"), where a machine translation is used as an English language document.

25. Regarding claims 1 and 4, Murase teaches an electroluminescent device comprising an anode and a cathode and a hole transporting layer and an electron transporting layer found between the two electrodes (paragraphs [0005]). Murase teaches the hole transporting layer can be composed of NPD, which the applicant teaches as a hole transporting material that is not soluble in alcohols (paragraph [0015]). Murase teaches the electron transporting material can be a non-ionic phosphine compound and the phosphine compound can have the following formula, formula (1), where Ar^1, R^1, and R^3 can be aryl groups, such as benzene, biphenyl, naphthyl, and phenanthrene (paragraphs [0028]-[0038] and [0043]), which meets applicant's formula (1). Murase teaches the electron transporting layer can be made by using spin coating a wet method (paragraph [0060]). Murase teaches

electroluminescent devices that comprise the phosphine oxide have excellent thermal stability, high luminous efficiency, low drive voltage, and excellent color purity (paragraph [0078]).

26. Murase does not specifically teach an electroluminescent device comprising the applicant's claimed invention.

27. Given the teaching of Murase, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make at electroluminescent device comprising in order an anode, a hole transporting layer composed of NPD, an electron transporting layer composed of a phosphine oxide of Murase's formula (1), where Ar^1, R^1, and R^2 are an aryl group such as benzene, biphenyl, naphthyl, and phenanthrene, a cathode and where the electron transporting layer is formed using spin coating. The motivation would have been to make an electroluminescent device with excellent thermal stability, high luminous efficiency, low drive voltage, and excellent color purity.

28. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase et al. (JP2004-095221) (hereafter "Murase"), where a machine translation is used as an English equivalent, in view of Spaochak et al. (WO 2005/073340) (hereafter "Spaochak").

29. Regarding claims 1 and 4, Murase teaches an electroluminescent device comprising an anode and a cathode and a hole transporting layer and an electron transporting layer found between the two electrodes (paragraphs [0005]). Murase teaches the hole transporting layer can be composed of NPD, which the applicant

teaches as a hole transporting material that is not soluble in alcohols (paragraph [0015]). Murase teaches the electron transporting material can be a non-ionic phosphine compound and the phosphine compound can have the following formula, formula (1), where Ar^1, R^1, and R^3 can be aryl groups, such as benzene, biphenyl, naphthyl, and phenanthrene (paragraphs [0028]-[0038] and [0043]), which meets applicant's formula (1). Murase teaches the compounds can contain two phosphine oxides (formula (2)). Murase teaches the electron transporting layer can be made by using spin coating a wet method (paragraph [0060]). Murase teaches electroluminescent devices that comprise the phosphine oxide have excellent thermal stability, high luminous efficiency, low drive voltage, and excellent color purity (paragraph [0078]).

30. Murase does not specifically teach an electroluminescent device comprising the applicant's claimed invention.

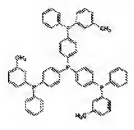
31. Spaochak teaches electroluminescent devices that are comprised of compounds containing diphosphines and these diphosphine are electron transporting (page 13 lines 6-13). Spaochak teaches the phosphine compounds to have the following structures, PO1 and PO8 (Figure 3). PO1 and PO8 are the same as the applicant's compounds (6-1) and (6-3); therefore, PO1 and PO8 are inherently soluble in alcohols.

32. Given the teaching of Murase and Spaochak, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make at electroluminescent device comprising in order an anode, a hole transporting layer composed of NPD, an electron transporting layer composed of a phosphine oxide, a

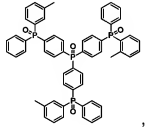
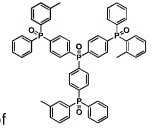
cathode and where the electron transporting layer is formed using spin coating. It would have been obvious to substitute the phosphine compounds of Murase for the phosphine compounds of Spaochak (PO1 and PO8). The substitution would have been one known electron transporting phosphine oxide for another, with the expected results of using phosphine oxides (PO1 and PO8) in the electron transporting layer of an electroluminescent device. The motivation to make the device with the phosphine compounds would have been to make an electroluminescent device with excellent thermal stability, high luminous efficiency, low drive voltage, and excellent color purity.

33. Claims 1 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuura et al. (JP 2003-317965) (hereafter "Matsuura"), where a machine translation is used as an English equivalent.

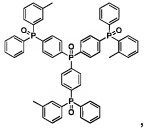
34. Regarding claims 1 and 4-6, Matsuura teaches an electroluminescent device comprising an anode and a cathode and a hole transporting layer and an electron transporting layer found between the two electrodes (paragraphs [0079]). Matsuura teaches the hole transporting layer can be composed of NPD, which the applicant teaches as a hole transporting material that is not soluble in alcohols (paragraphs [0091] and [0092]). Matsuura teaches the electron transporting material can be a non-ionic phosphine compound and the phosphine compound can have the following formula, formula (2), where X can be oxygen and R_{21}-R_{23} can be aryl groups, such as phenyl (paragraphs [0017]-[0042] and [0044]). Matsuura teaches a similar formula (5), which is similar to formula (2), except that the X group is missing, but in both formulae

R_{21}-R_{23} and R_{51}-R_{53} can be the same thing (paragraph [0068]). Matsuura teaches that the following compound represents formula (5),  (paragraph [0073]). Matsuura teaches the electron transporting layer can be made using spin coating (paragraph [0099]). Matsuura teaches that electroluminescent devices that use these phosphorous containing compounds have improved luminescence luminosity and lifetime (paragraph [0148]).

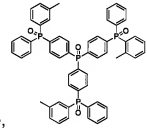
35. Matsuura does not specifically teach a compound that reads on applicant's formulas (2) and (3).

36. Given the teaches of Matsuura, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make a phosphine oxide compound with the following structure,  , and make an electroluminescent device comprising in order an anode, a hole transporting layer composed of NPD, an electron transporting layer composed of  and

deposited using a spin coating method, and a cathode. The made compound,

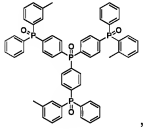


, has a structure that is similar to applicant formula (J), which the



applicant's teaches is inherently soluble in alcohols; therefore,

would be insoluble in alcohols. Matsuura teaches a similar compound to



, but the compound does not contain phosphine oxides, but Matsuura teaches that formula (2) and formula (5) only differ in that one contains an oxide; therefore, it would have been obvious to one of ordinary skill in the art the make the phosphine oxides in the compound taught by Matsuura. The motivation to make the electroluminescent device with the phosphine oxide would have been to improve luminescence luminosity and lifetime of the device.

Conclusion

37. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

38. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

39. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew K. Bohaty whose telephone number is (571)270-1148. The examiner can normally be reached on Monday through Thursday 7:30 am to 5:00 pm EST and every other Friday from 7:30 am to 4 pm EST.

40. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571)272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

41. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A Chriss/
Supervisory Patent Examiner, Art Unit 1786

/A. K. B./
Andrew K. Bohaty
Patent Examiner, Art Unit 1786